Aminoglycosides Mechanism of Action (MOA): Aminoglycosides bind irreversibly to the 30S ribosomal subunit of bacterial ribosomes, leading to: ● Inhibition of protein synthesis. ● Misreading of mRNA, causing the production of nonfunctional or toxic proteins. ● Disruption of bacterial membrane integrity, ultimately leading to cell death. This bactericidal activity is concentration-dependent. Classification: Aminoglycosides are a class of bactericidal antibiotics. Examples include: ● Gentamicin ● Tobramycin ● Amikacin ● Streptomycin ● Neomycin Spectrum of Activity: Aminoglycosides are primarily effective against: ● Gram-negative aerobes: E. coli, Klebsiella spp., Pseudomonas aeruginosa, Proteus spp. ● Limited activity against Gram-positive organisms, but often used synergistically with beta-lactams or vancomycin for infections caused by Enterococcus spp. or Staphylococcus aureus. ● Ineffective against anaerobic bacteria due to oxygen-dependent uptake. Dosing: Dosing varies based on the specific drug, indication, and patient factors (e.g., renal function). Typical approaches include: ● Gentamicin/Tobramycin: ● Conventional dosing: 1–2 mg/kg every 8 hours. ● Once-daily dosing: 5–7 mg/kg once daily. ● Amikacin: ● 15–20 mg/kg once daily. ● Adjustments for renal impairment are critical due to nephrotoxicity risks. ● Therapeutic drug monitoring (TDM) is often employed to optimize efficacy and minimize toxicity. Adverse Effects: Aminoglycosides are associated with significant toxicities, particularly with prolonged use or high doses: ● Nephrotoxicity: Reversible damage to renal tubules. ● Ototoxicity: Irreversible hearing loss or vestibular dysfunction. ● Neuromuscular blockade: Rare but can lead to respiratory paralysis, particularly in patients with underlying neuromuscular disorders or concurrent use of neuromuscular blockers. ● Hypersensitivity reactions: Rare.